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Claims

1. Hydraulic steering system (100) for a vehicle, in particular for a mobile machine, having at least two steering cylinders (1, 2), in which cylinder pistons (3, 4) are displaceable, the position and/or direction of motion of which in the steering cylinders (1, 2) fix the steering angle and/or steering direction of steerable vehicle wheels relative to a body (5) of the vehicle, wherein each of the displaceable cylinder pistons (3, 4) divides the associated steering cylinder (1, 2) into in each case two pressure chambers (6 and 7, 8 and 9), and having an, in terms of the volumetric displacement, variable first hydraulic pump (14), the first port (46) of which is connected, depending on the steering direction, to one of the pressure chambers (6, 7) of the first steering cylinder (1) and to one of the pressure chambers (8, 9) of the second steering cylinder (2),
characterized in
that the second port (15) of the variable first hydraulic pump (14) is connected in a closed circuit to the other pressure chamber (6, 7) of the first steering cylinder (1) and to the other pressure chamber (8, 9) of the second steering cylinder (2).

2. Hydraulic steering system according to claim 1,
characterized in
that in each case a first pressure chamber (7; 9) adjoins the associated cylinder piston (3; 4) with a pressurization area (A1) that is smaller than the pressurization area (A2), with which the in each case other second pressure chamber (6; 8) adjoins the

corresponding cylinder piston (3; 4), and
that each port (46; 15) of the hydraulic pump (14) is
connected to a first pressure chamber (7; 9) with a
smaller pressurization area (A1) and to a second
5 pressure chamber (8; 6) with a larger pressurization
area (A2).

3. Hydraulic steering system according to claim 1 or 2,
characterized in

10 that the delivery direction of the hydraulic pump (14)
operating in two-quadrant mode fixes the steering
direction.

4. Hydraulic steering system according to claim 3,
15 **characterized in**

that the pressure medium volume delivered at the first
port (46) and/or at the second port (15) of the
hydraulic pump (14) operating in two-quadrant mode
fixes the steering angle.

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5. Hydraulic steering system according to claim 4,
characterized in

25 that setting of the swivelling direction of the
hydraulic pump (14) and of the pressure medium volume
delivered at the first port (46) and at the second port
(15) of the hydraulic pump (14) is effected in
dependence upon a deflection set at a first steering
organ (43) designed in the style of a steering wheel
and/or at a second steering organ (44) designed in the
30 style of a joystick.

6. Hydraulic steering system according to claim 5,
characterized in

that in dependence upon the deflection of the first and/or second steering organ (43, 44) an adjusting valve (35) is activated.

- 5 7. Hydraulic steering system according to claim 6,
characterized in

that the deflection of the adjusting valve (35) is effected by means of electric actuating solenoids at control ports (40, 41), which receive from the first
10 and/or second steering organ (43, 44) in each case an electrical adjusting signal, which is generated by an electrical transducer (42, 64) and corresponds to the deflection of the first or second steering organ (43, 44).

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8. Hydraulic steering system according to claim 7,
characterized in

that the deflection of the adjusting valve (35) is effected by means of the adjusting pressures that act
20 in the control chambers situated at the two control ports (40, 41) and correspond to the deflection of the first or second steering organ (43, 44).

- 25 9. Hydraulic steering system according to claim 8,
characterized in

that at the first and second port (51, 55) of a variable second hydraulic pump (52) adjusting pressures arise, which correspond to the deflection of the first steering organ (43).

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10. Hydraulic steering system according to claim 8 or 9,
characterized in

that in a pilot unit (54) two pressure reduction valves

(62, 63), the inputs of which are connected in each case to the high-pressure port (19) of a feed pump (17) and to a hydraulic tank (61), generate the adjusting pressures corresponding to the deflection of the second steering organ (44).

11. Hydraulic steering system according to one of claims to 10,

characterized in

10 that the adjusting valve (35) is a 4/3-way valve, wherein the first input port (67) thereof is connected to the high-pressure port (19) of a feed pump (17), the second input port (68) thereof is connected to a hydraulic tank (39), the first output port (65) thereof is connected to a first adjusting pressure chamber (32) of a variation device (30) and the second output port (66) thereof is connected to a second adjusting pressure chamber (33) of the variation device (30).

20 12. Hydraulic steering system according to claim 11,

characterized in

that the variation of the first hydraulic pump (14) in terms of the swivelling direction and the pressure medium volume delivered at its first port (46) and the pressure medium volume delivered at its second port (15) is effected by means of the variation device (30).

13. Hydraulic steering system according to claim 11 or 12,

characterized in

30 that the first hydraulic pump (14) and the feed pump (17) are driven via a common drive shaft (16) by a mobile machine, in particular by a diesel-driven generating set.

14. Hydraulic steering system according to one of claims 11 to 13,

characterized in

5 that a low-pressure port (18) of the feed pump (17) is connected by a filter (20) to a hydraulic tank (21) and the high-pressure port (19) of the feed pump (17) is connected in each case by a non-return valve (21, 22) to a first hydraulic load line (12), which is connected to the first port (46) of the first hydraulic pump 10 (14), and to a second hydraulic load line (13), which is connected to the second port (15) of the first hydraulic pump (14).

15. Hydraulic steering system according to claim 14,

15 **characterized in**

that in the first and second hydraulic load lines (12, 13) in each case a non-return valve (47, 48) is provided.